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ABSTRACT

Over the past 20 years, library media professionals have worked to move from teaching isolated library skills to teaching integrated information skills. Effective integration of information skills has two requirements: (1) the skills must directly relate to the content area curriculum and to classroom assignments; and (2) the skills themselves need to be tied together in a logical and systematic information process model. Schools seeking to move from isolated computer skills instruction also need to focus on these requirements. Library media specialists, computer teachers, and classroom teachers need to work together to develop units and lessons that will include both computer skills, general information skills, and content-area curriculum outcomes. The "Big Six Skills Approach to Information Problem Solving" is an information literacy curriculum, an information problem-solving process, and a set of skills which provide a strategy for effectively and efficiently meeting information needs. This model is transferable to school, personal, and work applications, as well as all content areas and the full range of grade levels. The Big Six Skills include: (1) task definition; (2) information seeking strategies; (3) location and access; (4) use of information; (5) synthesis; and (6) evaluation. An addendum is included which presents skills and knowledge related to technology that are not part of the computer and information technology curriculum. Contains 24 references. (Author/AEF)

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ERIC Digest:

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Computer Skills for Information Problem-Solving: Learning and Teaching Technology in Context

by Michael B. Eisenberg and Doug Johnson

There seems to be clear and widespread agreement among the public and educators that students need to be proficient computer users —students need to be "computer literate." However, while districts are spending a great deal of money on technology, there seems to be only a vague notion of what computer literacy really means.

- Can the student who operates a computer well enough to play *Doom* be considered computer literate?
- Will a student who has used computers in school only for running tutorials or an integrated learning system have the skills necessary to survive in our society?
- Will the ability to do basic word processing be sufficient for students entering the workplace or post-secondary education?

Clearly not. In too many schools, most teachers and students still use computers only as the equivalent of expensive flash cards or electronic worksheets. The productivity side of computer use in the general content area curriculum is neglected or grossly underdeveloped (Moursund, 1995).

There are, however, some encouraging signs concerning computers and technology in education. For example, it is becoming increasingly popular for educational technologists to advocate integrating computers into the content areas. Teachers and administrators are recognizing that computer skills should not be taught in isolation, and that separate "computer classes" do not really help students learn to apply computer skills in meaningful ways. This is an important shift in approach and emphasis. And it's a shift with which library media specialists have a great deal of familiarity.

Library media specialists know that moving from isolated skills instruction to an integrated approach is an important step that takes a great deal of planning and effort. Over the past 20 years, library media professionals have worked hard to move from teaching isolated "library skills" to teaching integrated information skills. Effective integration of information skills has two requirements:

(1) the skills must directly relate to the content area curriculum and to classroom assignments, and
(2) the skills themselves need to be tied together in a logical and systematic information process model.

Schools seeking to move from isolated computer skills instruction will also need to focus on both of these requirements. Successful integrated information skills programs are designed around collaborative projects jointly planned and taught by teachers and library media professionals. Computer skills instruction can follow the same approach. Library media specialists, computer teachers, and classroom teachers need to work together to develop units and lessons that will include both computer skills, general information skills, and content-area curriculum outcomes.

A meaningful, unified computer literacy curriculum must be more than "laundry lists" of isolated skills, such as:

- knowing the parts of the computer
- writing drafts and final products with a word processor
- searching for information using a CD-ROM database.

While these specific skills are certainly important for students to learn, the "laundry list" approach does not provide an adequate model for students to transfer and apply skills from situation to situation. These curricula address the "how" of computer use, but rarely the "when" or "why." Students may learn isolated skills and tools, but they will still lack an understanding of how those various skills fit together to solve problems and complete tasks. Students need to be able to use computers flexibly, creatively and purposefully. All learners should be able to recognize what they need to accomplish, determine whether a computer will help them to do so, and then be able to use the computer as part of the process of accomplishing their task. Individual computer skills take on a new meaning when they are integrated within this type of information problem-solving process, and students develop true "computer literacy" because they have genuinely applied various computer skills as part of the learning process.

The curriculum outlined on pages 2-3, "Computer Skills for Information Problem-Solving," demonstrates how computer literacy skills can fit within an information literacy skills context (American Association of School Librarians, 1995). The baseline information literacy context is the Big Six Skills process (see sidebar and Eisenberg & Berkowitz cites). The various computer skills are adapted from curricula developed by the state of Minnesota (Minnesota Department of Education, 1989) and the Mankato Area Public Schools (Mankato Schools Information Literacy Curriculum Guideline). These basic computer skills are those which all students might reasonably be expected to authentically demonstrate before graduation. Since Internet-related skills are increasingly important for information problem-solving, they are included in this curriculum, and are noted by an asterisk.

(continued on page 4)...

Computer Skills for Information Problem-Solving: A Curriculum Based on the Big Six Skills Approach [+]

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1. Task Definition:

The first step in the information problem-solving process is to recognize that an information need exists, to define the problem, and to identify the types and amount of information needed. In terms of technology, students will be able to:

A. Use e-mail, and online discussion groups (e.g., listservs, newsgroups) on the Internet to communicate with teachers regarding assignments, tasks, and information-problems.*
B. Use e-mail, and online discussion groups (e.g.,listservs, newsgroups) on the Internet to generate topics and problems and to facilitate cooperative activities among groups of students locally and globally.*
C. Use desktop conferencing, e-mail, and groupware software on local area networks to communicate with teachers regarding assignments, tasks, and information problems.
D. Use desktop conferencing, e-mail, and groupware software on local area networks to generate topics and problems and to facilitate cooperative activities among groups of students locally.
E. Use computer brainstorming or idea generating software to define or refine the information problem. This includes developing a research question or perspective on a topic.

2. Information Seeking Strategies:

Once the information problem has been formulated, the student must consider all possible information sources and develop a plan for searching. Students will be able to:

A. Assess the value of various types of electronic resources for data gathering, including databases, CD-ROM resources, commercial and Internet online resources, electronic reference works, community and government information electronic resources.*
B. Identify and apply specific criteria for evaluating computerized electronic resources.
C. Assess the value of e-mail, and online discussion groups (e.g., listservs, newsgroups) on the Internet as part of a search of the current literature or in relation to the information task.
D. Use a computer to generate modifiable flow charts, Gantt charts, time lines, organizational charts, project plans and calendars which will help the student plan and organize complex or group information problem-solving tasks.

3. Location and Access:

After students determine their priorities for information seeking, they must locate information from a variety of resources and access specific information found within individual resources. Students will be able to:

A. Locate and use appropriate computer resources and technologies available within the school library media center, including those on the library media center's local area network, (e.g., online catalogs, periodical indexes, full-text sources, multimedia computer stations, CD-ROM stations, online terminals, scanners, digital cameras).
B. Locate and use appropriate computer resources and technologies available throughout the school including those available through local area networks (e.g., full-text resources, CD-ROMs, productivity software, scanners, digital cameras).
C. Locate and use appropriate computer resources and technologies available beyond the school through the Internet (e.g., newsgroups, listservs, WWW sites via Netscape, Lynx or another browser, gopher, ftp sites, online public access library catalogs, commercial databases and online services, other community, academic, and government resources).*
D. Know the roles and computer expertise of the people working in the school library media center and elsewhere who might provide information or assistance.
E. Use electronic reference materials (e.g., electronic encyclopedias, dictionaries, biographical reference sources, atlases, geographic databanks, thesauri, almanacs, fact books) available through local area networks, stand-alone workstations, commercial online vendors, or the Internet.
F. Use the Internet or commercial computer networks to contact experts and help and referral services.*
G. Conduct self initiated electronic surveys conducted through e-mail, listservs or newsgroups.*
H. Use organizational systems and tools specific to electronic information sources that assist in finding specific and general information (e.g., indexes, tables of contents, user's instructions and manuals, legends, boldface and italics, graphic clues and icons, cross-references, Boolean logic strategies, time lines, hypertext links, knowledge trees, URLs etc.) including the use of:
    1. search tools and commands for stand-alone, CD-ROM, and online databases and services (e.g., DIALOG commands, America Online, UMI, Mead);
    2. search tools and commands for searching the Internet (e.g., Yahoo, Lycos, WebCrawler, Veronica, Archie).*

4. Use of Information:

After finding potentially useful resources, students must engage (read, view, listen) the information to determine its relevance and then extract the relevant information. Students will be able to:

A. Connect and operate the computer technology needed to access information, and read the guides and manuals associated with such tasks.
B. View, download, decompress and open documents and programs from Internet sites and archives.*
C. Cut and paste information from an electronic source into a personal document complete with proper citation.
D. Take notes and outline with a word processor or similar productivity program.
E. Record electronic sources of information and locations of those sources to properly cite and credit in footnotes, endnotes, and bibliographies.
F. Use electronic spreadsheets, databases, and statistical software to process and analyze statistical data.
G. Analyze and filter electronic information in relation to the task, rejecting non-relevant information.

5. Synthesis:

Students must organize and communicate the results of the information problem-solving effort. Students will be able to:

A. Classify and group information using a word processor, database or spreadsheet.
B. Use word processing and desktop publishing software to create printed documents, applying keyboard skills equivalent to at least twice the rate of handwriting speed.
C. Create and use computer-generated graphics and art in various print and electronic presentations.
D. Use electronic spreadsheet software to create original spreadsheets.
E. Generate charts, tables and graphs using electronic spreadsheets and other graphing programs.
F. Use database/file management software to create original databases.
G. Use presentation software (e.g., *PowerPoint, HyperStudio, Aldus Persuasion*) to create electronic slide shows and to generate overheads and slides.
H. Create hypermedia and multimedia productions with digital video and audio.
I. Create World Wide Web pages and sites using hypertext markup language (HTML).*
J. Use e-mail, ftp, and other telecommunications capabilities to share information, products, and files.*
K. Use specialized computer applications as appropriate for specific tasks, e.g., music composition software, computer assisted drawing and drafting programs, mathematics modeling software.
L. Properly cite and credit electronic sources of information in footnotes, endnotes, and bibliographies.

6. Evaluation:

Evaluation focuses on how well the final product meets the original task (effectiveness) and the process of how well students carried out the information problem-solving process (efficiency). Students may evaluate their own work and process or be evaluated by others (i.e. classmates, teachers, library media staff, parents). Students will be able to:

A. Evaluate electronic presentations in terms of both the content and format.
B. Use spell and grammar checking capabilities of word processing and other software to edit and revise their work.
C. Apply legal principles and ethical conduct related to information technology related to copyright and plagiarism.
D. Understand and abide by telecomputing etiquette when using e-mail, newsgroups, listservs and other Internet functions.*
E. Understand and abide by acceptable use policies in relation to use of the Internet and other electronic technologies.
F. Use e-mail, and online discussion groups (e.g., listservs, newsgroups) on local area networks and the Internet to communicate with teachers and others regarding their performance on assignments, tasks, and information-problems.*
G. Use desktop conferencing, e-mail, and groupware software on local area networks to communicate with teachers and others regarding student performance on assignments, tasks, and information problems.
H. Thoughtfully reflect on the use of electronic resources and tools throughout the process.

The Big Six Skills Approach to Information Problem Solving

copyright Eisenberg and Berkowitz, 1988.

The Big Six is an information literacy curriculum, an information problem-solving process, and a set of skills which provide a strategy for effectively and efficiently meeting information needs. The Big Six Skills approach can be used whenever students are in a situation, academic or personal, which requires information to solve a problem, make a decision or complete a task. This model is transferable to school, personal, and work applications, as well as all content areas and the full range of grade levels. When taught collaboratively with content area teachers in concert with content-area objectives, it serves to ensure that students are information literate.

The Big Six:

1. Task Definition
- 1.1 Define the task (the information problem)
- 1.2 Identify information needed in order to complete the task (to solve the information problem)

2. Information Seeking Strategies
- 2.1 Brainstorm all possible sources
- 2.2 Select the best sources

3. Location and Access
- 3.1 Locate sources
- 3.2 Find information within the source

4. Use of Information
- 4.1 Engage in the source (read, hear, view, touch)
- 4.2 Extract relevant information

5. Synthesis
- 5.1 Organize information from multiple sources
- 5.2 Present the information

6. Evaluation
- 6.1 Judge the process (efficiency)
- 6.2 Judge the product (effectiveness)

Addendum:

Included here are skills and knowledge related to technology that are not part of the computer and information technology curriculum. These items should be learned in context, i.e., as students are working through various assignments and information problems using technology. Students will be able to:

A. Know and use basic computer terminology.
B. Operate various pieces of hardware and software—particularly operating systems—and be able to handle basic maintenance.
C. Understand the basics of computer programming. Specific courses in computer programming should be part of the school's curricular offerings.
D. Understand and articulate the relationship and impact of information technology on careers, society, culture, and their own lives.

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* Items are specific to Internet use.

† This curriculum guide is an excerpt from *Computer Skills for Information Problem-Solving: Learning and Teaching Technology in Context*, ERIC Digest (1996, March), prepared by Michael B. Eisenberg and Doug Johnson for the ERIC Clearinghouse on Information & Technology, Syracuse, NY. (ED number pending, IR 055 809)

(continued from page 1) . . .

Some computer literacy "skills" competencies which do not seem to fit into this information processing model, and which may or may not be important to have stated include:

- knowing the basic operation, terminology, and maintenance of equipment
- knowing how to use computer-assisted instructional programs
- having knowledge of the impact of technology on careers, society, and culture
- computer programming
- specialized computer applications like music composition software, computer assisted drawing and drafting programs, mathematics modeling software, etc.

Listing computer skills is only a first step in assuring all our children become proficient information and technology users. A teacher supported scope and sequence of skills, well designed projects, and effective assessments are also critical. Many library media specialists will need to hone their own technology skills in order to remain effective information skills teachers. But such a curriculum holds tremendous opportunities for library media specialists to become vital, indispensable staff members, and for all children to master the skills they will need to thrive in an information rich future.

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